

CLAIMS:

1. A method of determining the amount of nitrogen in a gas mixture, the mixture also containing a least one hydrocarbon constituent, comprising the steps of:
  - 5       dissociating nitrogen atoms;
  - dissociating hydrogen atoms from at least one hydrocarbon constituent;
  - associating nitrogen atoms with the hydrogen atoms, thereby producing ammonia;
  - 10       measuring the ammonia; and
  - determining the amount of nitrogen, based on the amount of ammonia.
2. The method of Claim 1, wherein the gas mixture  
15 is a natural gas mixture.
3. The method of Claim 1, wherein the hydrocarbon constituent is methane.
- 20       4. The method of Claim 1, wherein the dissociating and associating steps are performed by adding energy to the gas mixture in the form of a thermalizing electrical arc.
- 25       5. The method of Claim 1, wherein the dissociating and associating steps are performed by adding energy to the gas mixture in the form of a nonthermal plasma discharge.

6. The method of Claim 5, wherein the nonthermal plasma discharge is controlled in energy such that it is sufficient to dissociate nitrogen atoms but insufficient to dissociate constituents having higher bond strength.

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7. The method of Claim 1, wherein the dissociating and associating steps are performed by catalytic methods.

8. The method of Claim 1, wherein the measuring  
10 step is performed using infrared absorption techniques.

9. The method of Claim 8, wherein the infrared absorption is performed at a wavelength of 10.34 micrometers.

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10. The method of Claim 8, wherein the infrared absorption is performed at a wavelength of 10.74 micrometers.

20 11. The method of Claim 1, wherein the dissociating and associating steps occur in a nonthermal plasma discharge chamber.

25 12. The method of Claim 1, further comprising the steps of repeating all steps for successive samples of the gas mixture.

13. The method of Claim 12, wherein the repeating steps are consistent with each other.

14. A method of determining the amount of nitrogen in a gas mixture, the mixture also containing a least one hydrocarbon constituent, comprising the steps of:

- 5        reforming the gas mixture to produce ammonia;  
         measuring the ammonia; and  
         determining the amount of nitrogen, based on the  
         amount of ammonia.

- 10       15. The method of Claim 14, wherein the reforming  
         step is performing with a nonthermal plasma discharge  
         chamber having a conductive inlet end at a first  
         electrical potential and a conductive outlet end at a  
         second electrical potential, the inlet end and the outlet  
15       end being electrically separated, and the discharge  
         chamber having a nozzle that passes through the inlet end  
         to receive the gas mixture and to eject the gas mixture  
         into a hollow sleeve where the gas mixture dissociates  
         and reforms into the ammonia then exits the outlet end.

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16. A method of determining the amount of nitrogen in a gas mixture, the mixture also containing a least one hydrocarbon constituent, comprising the steps of:

bombarding the nitrogen with electrons, thereby  
5 producing nearly-dissociated states of a diatomic molecular nitrogen ion;

reacting the diatomic molecular nitrogen ions with nitrogen, thereby producing triatomic molecular nitrogen ions;

10 measuring the amount of triatomic molecular nitrogen ions; and

correlating the results of the measuring step to the amount of nitrogen.

15 17. The method of Claim 16, wherein the bombarding step is performed using a beta emitting radioactive source.

18. The method of Claim 17, wherein the radioactive  
20 source is  $^{63}\text{Ni}$ .

19. The method of Claim 16, wherein the bombarding step is performed in nonthermal plasma discharge chamber having an inlet end and an outlet end, and the discharge  
25 chamber having a nozzle that passes through the inlet end to receive the gas mixture and to eject the gas mixture into a hollow sleeve where the gas mixture is ionized, dissociated, and reformed into triatomic molecular ions.

30 20. The method of Claim 16, wherein the gas mixture is a natural gas mixture.

21. A method of measuring the amount of nitrogen in a gas mixture, comprising the steps of:

dissociating the nitrogen in the gas mixture within a nonthermal plasma reaction chamber;

5 transforming the nitrogen, within the nonthermal plasma reaction chamber, into a substance detectable by nondispersive infrared detector;

detecting the substance with the infrared detector; and

10 inferring the amount of nitrogen from the results of the detecting step.

22. The method of Claim 21, wherein the gas mixture contains hydrogen and the transforming step is performed  
15 by transforming the nitrogen to ammonia.

23. The method of Claim 21, wherein the transforming step is performed by transforming the nitrogen to triatomic molecular nitrogen ions.

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24. The method of Claim 21, wherein the gas mixture is a natural gas mixture.